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Simulations of Laser Experiments at the QED Frontier

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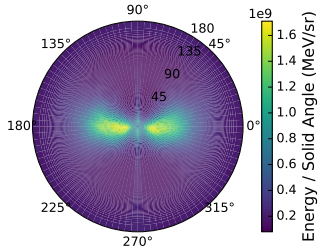
High-energy photons emitted into two ‘jets’

- Simulations of certain experimental configurations using QED models show photons are directed into narrow ‘jets’
- Jets are split along laser polarization
- No wavelength-scale structure in target needed

Photon Energy Deposition
$E_\gamma > 1\,\mathrm{MeV}$

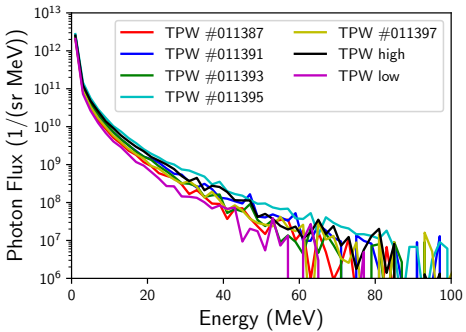


Simulation parameters: $60 n_{cr}$, 10 µm carbon target, $T_e = 10$ keV, $T_i = 10$ eV, $I_0 = 3.02 \times 10^{23}$ W/cm^2, FWHM = 150 fs, F/1.0, S-polarized, 60 e^- and 20 C^{6+} per cell, 10 nm cell size

Simulations with laser parameters from real shots predict variations in QED production

- Pulse energy varies from 85.3–100.4 J
- Intensity varies from 1.86–2.54 $\times$ 10^{22} W/cm^2
- Highest energy pulse does not produce highest flux jet
- Laser instability about doubles simulation-to-simulation differences
- These fluxes should be detectable in experiments; would be first observation of photons from this method

Photon Spectra $(\theta, \phi) = (20, 0)$



Simulation parameters: $60 n_{cr}$, 10 µm carbon target, $T_e = 10$ keV, $T_i = 10$ eV, 1.25 µm spot size, S-polarized, 60 electrons and ions per cell, 10 nm cell size